Regional technological capabilities and the access to H2020 funds

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Aim

Two key converging points have emerged in the EU policy debate with respect to innovation and cohesion:

I. Since the Lisbon Strategy (2000), fostering science, technology, innovation, and human capital is a key ingredient of any policy for a cohesive and competitive EU *(Lorenz and Lundvall, 2006)*

II. Regions have steadily increased their relevance as key spatial and socio-economic units and policy targets of cohesion and S&T policies *(European Commission, 2011; Boschma and Frenken, 2011)*

Despite EU S&T policies do not operate at a regional scale nor are designed to address the cohesion issue, they might have an impact on the level of scientific and technological cohesion of EU

To what extent is the current EU S&T framework consistent with the cohesion target?

Motivation

Most of the literature on the EU FPs rely on the collaborative design of these funds to explore the effectiveness of EU network policies *(Breschi and Cusumano, 2004)*:

- Contribution in favouring interdisciplinary research *(Bruce et al., 2004)*
- The role of collaborative network properties in generating and diffusing knowledge *(Breschi et al., 2009)*
- The factors leading to regional R&D collaborations *(Amoroso et al., 2018)*

EU policies have favoured the integration of European research around poles of highly connected actors (places)

The beneficial effect of network participation seems to be particularly relevant for less endowed regions

Motivation

The main policy scheme for EU cohesion operating at a regional scale only to a limited extent allocates resources to R&D and innovation *(Medve-Bálint, 2018)*

There is very limited empirical evidence on the role played by S&T EU policies in favouring technological convergence or polarization

Existing EU S&T policies might have a twofold effect on cohesion:

- The objective of creating an integrated European Research Area may complement cohesion policies reducing technological disparities across EU
- Competitive S&T schemes focusing on excellence to strength the role of EU innovation system in the global arena may instead exacerbate existing differences

Main data

Patents from OECD REGPAT

→ Patent data from EPO linked to regions according to the addresses of the inventors

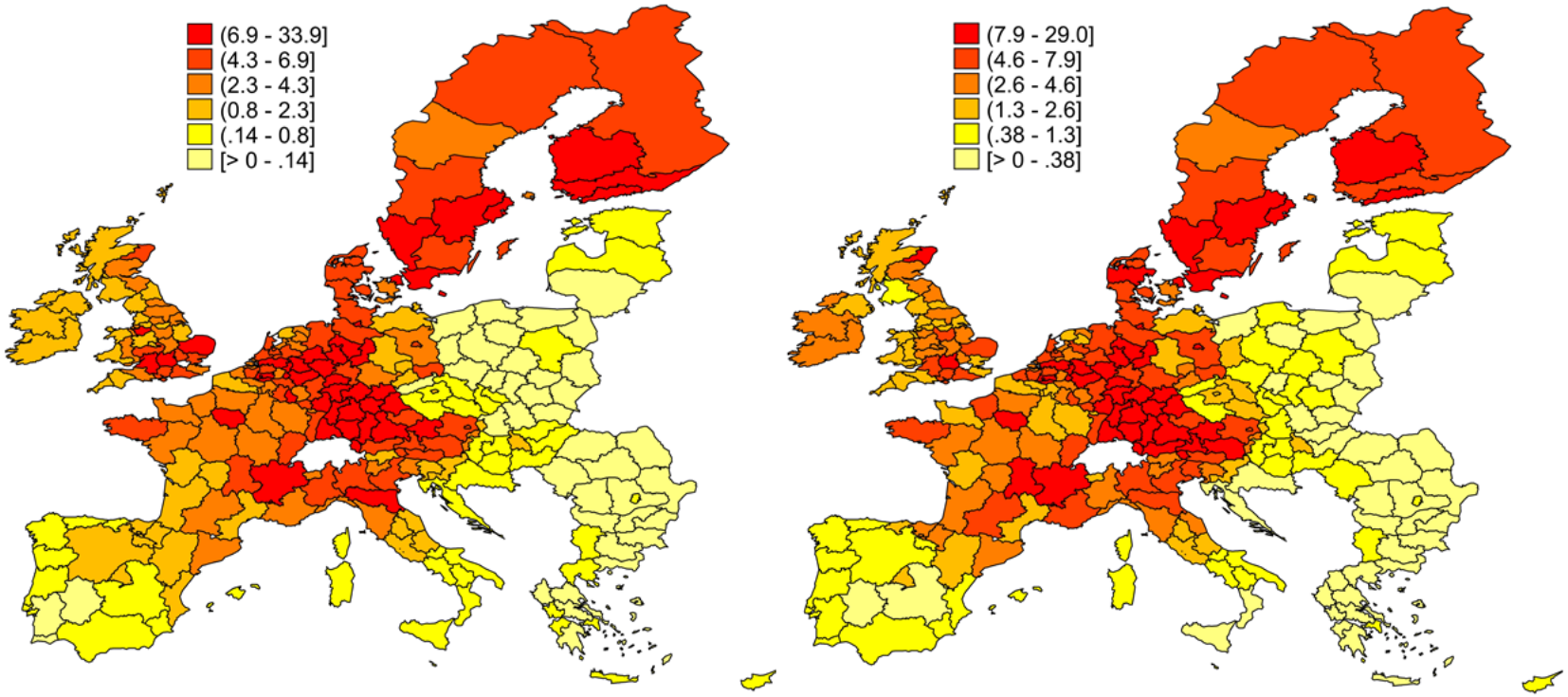
Community Research and Development Information Service (CORDIS) for H2020

→ Two advantages:

I. Breakdown of budget at the level of project partners *(previously the whole budget was associated to the project coordinator)*

II. Possibility to breakdown to the different H2020 schemes. In particular, the European Research Council (ERC), a relative novelty in the EU policy framework (established in 2007)

Patents per 10,000 habitants: 2001-2004 (left) and 2013-2016 (right)



Well known strong macro-regional differences in the patent intensity and heterogeneity within most EU countries

High degree of stability of EU technological landscape with persistent (large) gaps between regional areas of EU

An overview of the main H2020 actions

Action	Eligibility Criteria	Target	% of H2020 (% in sample) [% of projects]
European Research Council (ERC)	**Single researchers**	(frontier) Research	19% (19%) [21%]
Marie Skłodowska-Curie Actions (MSCA)	**Single researchers or research networks**	Mobility Collaboration Networking Dissemination	9% **(10%)** **[32%]**
Research & innovation actions (RIA)	**At least 3 legal entities in different countries**	Research Development	**(38%)** **[14%]**
Innovation actions (IA)	**At least 3 legal entities in different countries**	Research Development Pre-production	**(18%)** **[7%]**

→ Small average project size

With a competitive logic may favour more endowed regions in accessing funds VS. the aim of integrating more peripherical regions to develop an integrated research area may act as a counterweight

The ERC and MSCA strongly stress the scientific excellence, the RIA and IA reflect a more collaborative logic

Econometric specification

Log-log specification to estimate the elasticity of H2020 with respect to patents:

$$\log(h2020_{i,2015-2019} + 1) = a + \beta \log(patents_{i,2010-2014} + 1) + controls + \mu_c + u_i$$

$\beta = 1$ → a 1% increase in technological capabilities is reflected in the same increase of H2020 funds

$\beta > 1$ → H2020 funds increase more than proportionally (a kind of polarizing effect is at work)

$\beta < 1$ → H2020 funds increase less than proportionally (a kind of equalizing effect is at work)

We first estimate the relationship on the H2020 funds received and then by specific schemes

Controls

Capital regions → in many countries outperform other areas from a scientific and innovative viewpoint

Gdp per capita → factors contributing to the strength of the regional system beyond strict technological capabilities

Population density → agglomeration economies and localized knowledge spillovers

μ_c → country effects (we also cluster errors at country level)

H2020 funds at regional level, OLS

	H2020	H2020
Patents (log)	1.077***	0.888***
	(0.060)	(0.069)
Population density (log)		0.218**
		(0.094)
Capital region		0.674***
		(0.183)
GDP per capita (log)		0.143
		(0.318)
Country fixed effects	Yes	Yes
Constant	12.99***	10.89***
	(0.347)	(0.857)
Test beta patents = 1	0.271	0.112
Observations	259	259
Adj. R-squared	0.715	0.741
RMSE	0.933	0.877

- EU distributes R&I funds proportional to the knowledge capabilities of regions
- Agglomeration economies and localized knowledge spillovers
- Critical mass and presence of S&T infrastructures

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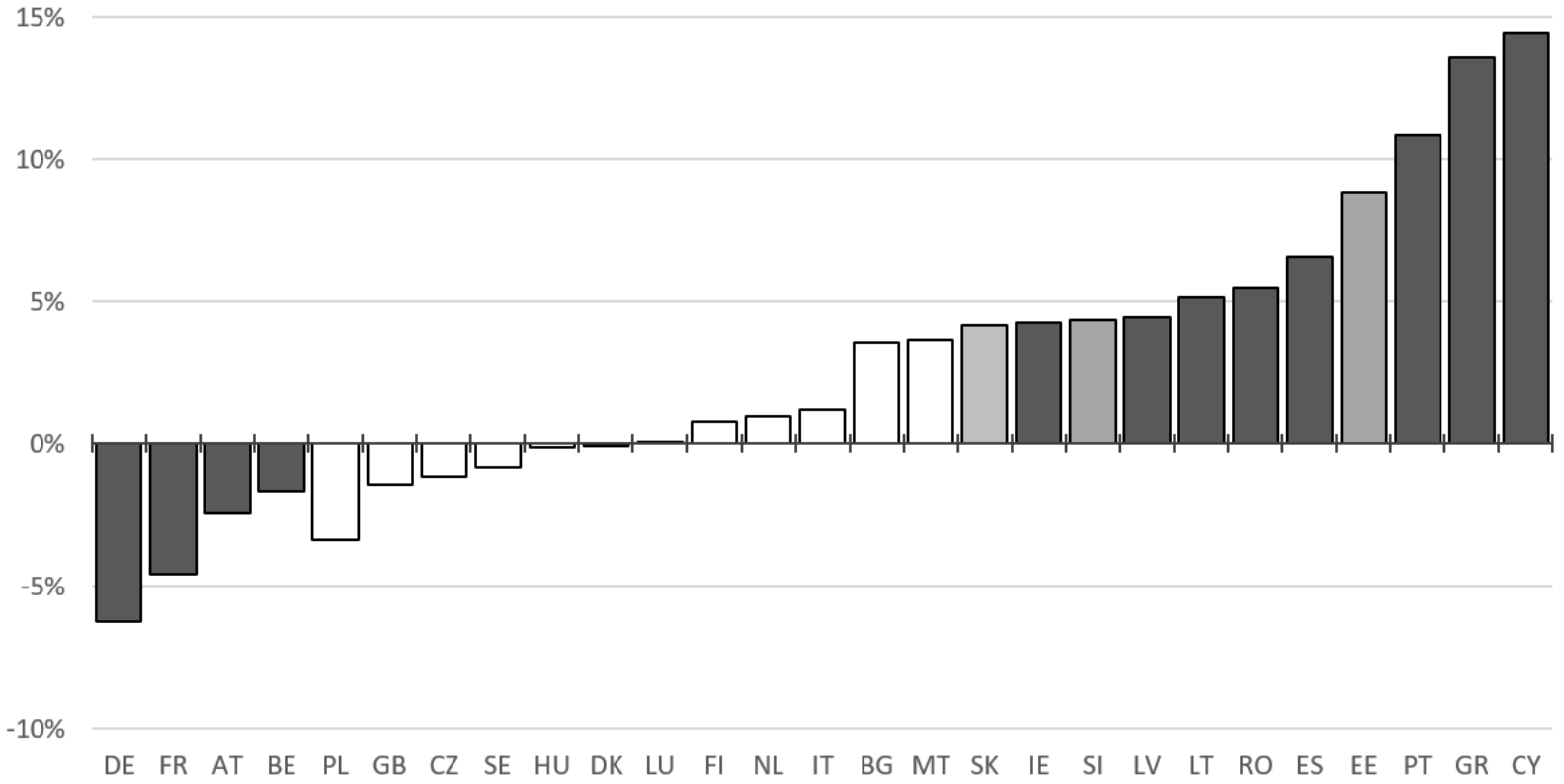
Country group	H2020	ERC	MCSA	RIA	IA	Patents
North EU	9.1%	**8.7%**	9.9%	8.2%	8.9%	**9.8%**
Central EU	60.6%	**74.1%**	60.5%	60.5%	54.9%	**76.2%**
South EU	23.3%	**13.8%**	21.7%	25.1%	29.7%	**10.8%**
East EU	7.0%	**3.4%**	7.7%	6.0%	6.5%	**3.1%**
Total	100%	**100%**	100%	100%	100%	**100.0%**

How to reconcile the unitary elasticity of H2020 funds to patents with the fact that the former are concentrated than the latter (favouring regions from Eastern and Southern countries)?

Country fixed effects



Dark grey: significant at 5%

Light grey: significant at 10%

Once controlling for other factors, regions from Germany, France, Austria and Belgium receive on average less funds, while regions from countries on the right part of the figure receive “a premium”

→ *Rebalancing rational of H2020 with respect to the existing macro-regional technological asymmetries*

Estimates on specific actions

	ERC	MSCA	RIA	IA
Patents (log)	3.305***	1.605***	1.057***	0.919***
	(0.296)	(0.276)	(0.193)	(0.135)
Population density (log)	1.003**	0.0283	0.193*	0.0923
	(0.403)	(0.319)	(0.110)	(0.134)
Capital region	2.355	1.543*	0.672**	0.668**
	(1.622)	(0.758)	(0.324)	(0.312)
GDP per capita (log)	-2.257	-0.95	0.417	0.512
	(1.696)	(1.061)	(0.449)	(0.394)
Country fixed effects	Yes	Yes	Yes	Yes
Constant	-6.096	7.896**	8.005***	8.341***
	(5.029)	(3.277)	(1.754)	(1.497)
Test beta patents = 1	0.000***	0.038**	0.77	0.553
Observations	259	259	259	259
Adj. R-squared	0.508	0.33	0.564	0.516
RMSE	5.423	3.269	1.759	1.661

ERC

- An increase of the technological capabilities is matched by a threefold increase of funds

- Focus on excellence may favour densely populated urban areas

MSCA

- Coefficient attached to patents statistically larger than 1

For the RIA and IA, the results are in line with the main regressions

Conclusions

- While respecting a competitive logic the H2020 funds have been able to not let behind regions located in less technological advanced places (countries)
- Heterogeneous role of the different H2020 schemes for regional convergence/polarization
- Schemes prizing excellences seem to exacerbate the differences in the knowledge capabilities of regions possibly contributing to the process of polarization between European regions
- It is likely that a rebalancing mechanism will continue to operate in the Horizon Europe programme
- Two possibly conflicting objectives: excellence may require further agglomeration of competences in strong areas of EU, nurture capabilities also in less developed regions

A policy suggestion

The role played by different regional administrative capacity in determining an effective implementation of cohesion policies is an emerging theme in the literature *(Ederveen et al., 2006; Terracciano and Graziano, 2016, Rodriguez-Pose and Garcilazo, 2015)*

Top-down policies might be more effective especially in the case of regions with a weaker socio-economic environment (Crescenzi and Giua, 2016) and policy coordination increases the returns from cohesion policies

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Rather than trying to increase the share of cohesion funds dedicated to innovation, it could be envisaged a reallocation of part of the cohesion funds to "collaborative-inclusive" S&T schemes

→ this would level-off the institutional disparities that contribute to the different performance of regions